

MISSOURI MONTHLY VITAL STATISTICS

Provisional Statistics From The

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Focus...Maternal and Infant Health in Missouri Trends Over the 20th Century

Introduction:

Vital record data has been collected in Missouri for almost an entire century. The Missouri General Assembly passed legislation on May 6, 1909 giving the Board of Health authority and power to register all births and deaths in the state. The first tabulations were published in 1911, reporting on the months February through December, of 1910.¹ Vital statistics are available from 1911 through 2000 for analysis of several measures. Results might be skewed because it was more likely that births and deaths would go unregistered in the early years, when the system was new. There were changes in methods used for collecting and reporting some data, making direct comparison of certain measures invalid. Inaccurate and/or incomplete reporting is always a potential problem, as are errors in compiling and reporting data. Fortunately, these do not preclude the benefits of analyzing the available data.

This report focuses on selected health indicators for Missouri mothers and infants from birth and infant death records during the 20th century. The availability of these data lends itself to such a report. Certain indicators, such as maternal and infant deaths, have historically been considered to be measures of the well being of women, children, and the population at large. The indicators of interest for this report are fertility and birth rates;

maternal mortality and female life expectancy; infant mortality and low birth weight; and out of wedlock births.

Methods:

Population

Unless otherwise indicated, the vital statistics presented in this paper are taken from the Missouri report of vital statistics for each year. Population data used to produce rates is taken from U.S. Census Bureau reports. It is assumed that all statistics and rates are for residents of Missouri. Prior to 1945 however, Missouri vital statistic reports did not differentiate between "resident" and "recorded" events. Vital statistics were reported based on where the event occurred, that is as "recorded" events. In other words, babies delivered in Missouri whose mothers resided in other states, would be counted as Missouri births and babies delivered in neighboring states whose mothers resided in Missouri, would not be included in the total births for Missouri. Since 1945 the annual vital statistics report has included "recorded" events and "resident" events. For instance, if a mother who resided in Missouri delivered her baby in Kansas, it would not be counted as a "recorded" birth in Missouri, but it would be counted as a "resident" birth.

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Reporting by Race

For reporting vital statistics, the term “race” refers to the division of Missouri’s population into three groups: “white”, “black” and “other”. The group designated as “other” consists of such races as American Indian, Japanese, Chinese, Filipino, Korean, Asian Indian and Malayan. For any given year, “other” births make up less than three percent of Missouri’s total births and “black” births make up approximately 15 percent. With few exceptions, annual vital statistic reports simply use two divisions, “white” and either “black/other” or “Non-white”, when reporting by race because of the small number of persons of other races in Missouri. The sum of the two divisions equals the total. Beginning in 1989, vital statistic reports used “white” and “black”. “Other” races are implied to be the difference between the total and the sum of “white” and “black”. Persons of South American, Central American, or Caribbean birth or ancestry who are not definitely of Indian or other designated race are classified as “white”. Hispanic ancestry is considered an ethnicity rather than a race and is tabulated separately beginning in 1989.

Beginning with the 1989 report, birth and infant death data were recorded by race of mother. Before 1989 this data was presented by race of the child. This change was implemented to be consistent with the National Center for Health Statistics (NCHS), which also implemented the change in 1989.² Previously, race of child had been computed by an algorithm based on the race of the mother and race of father. Persons of mixed parentage were classified according to the race of the nonwhite parent. Because of this rather arbitrary formula and the increasing proportion of out-of-wedlock births in which the father’s race was missing, it was decided by NCHS to implement this change to race of mother. When examining trends in birth indicators by race, it is not appropriate to compare rates by race of mother with rates by race of child.

The 2000 United States Census allowed respondents to select from 31 race categories, including multiple race categories following the 1997 Office of Management and Budget (OMB) standards. Vital record systems at that time were

still using the 1977 OMB standards for reporting race. A bridging technique was developed under a cooperative agreement between the National Center for Health Statistics and the U.S. Census Bureau to relate the two standards to each other. The technique makes it possible to produce population-based rates by race and compare them to previous years. The denominators for the white and non-white fertility rates for 2000 are based on estimates of the 2000 census using this technique. More information about the bridging technique can be found at <http://www.cdc.gov/nchs/about/major/dvs/popbridge/popbridge.htm>.

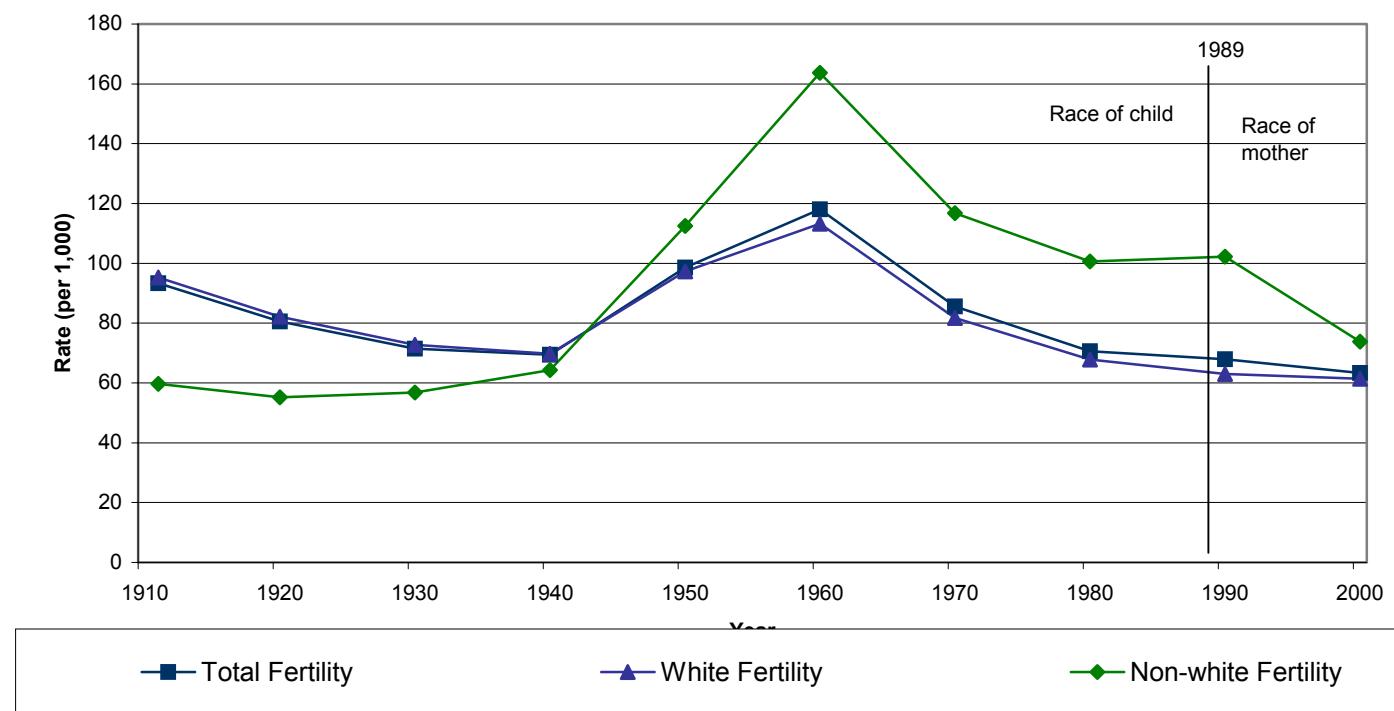
Analysis

Because of the relatively small number of events, changes in maternal mortality and infant mortality were analyzed using a methodology described by Joel C. Kleinman.³ It was assumed that the number of deaths reported in a year followed a Poisson, rather than a linear, distribution. Five-year moving average trend lines were plotted on a logarithmic scale, and the trend line was partitioned based on visual changes in the trend over time. Using weighted least squares, the slope for each partitioned period was calculated and compared to the preceding period to determine whether there was a significant change. In addition, the percent annual change was calculated within each period.

Fertility and Births

Fertility rates are the number of births per 1,000 women of childbearing age, usually considered to be ages 15-44. This rate and the total number of births fundamentally affect the size and composition of a population. Chart 1 shows Missouri’s total fertility rate, and the white and non-white rates, beginning with 1911 and each census year through 2000. The rate fell consistently over the first decades, from 93.3 in 1911 to 69.4 per 1,000 females aged 15-44 in 1940. The post-World War II “baby boom” is evident in the dramatic increase from 1940 through 1960, when the fertility rate peaked at 118.1. Over the next 20 years, total fertility returned to pre-“boom” levels, falling to 70.6 per 1,000 in 1980. The drop

**Chart 1: Missouri Trends in Fertility Rates
(per 1,000 Females Age 15-44) by Race: 1911-2000**



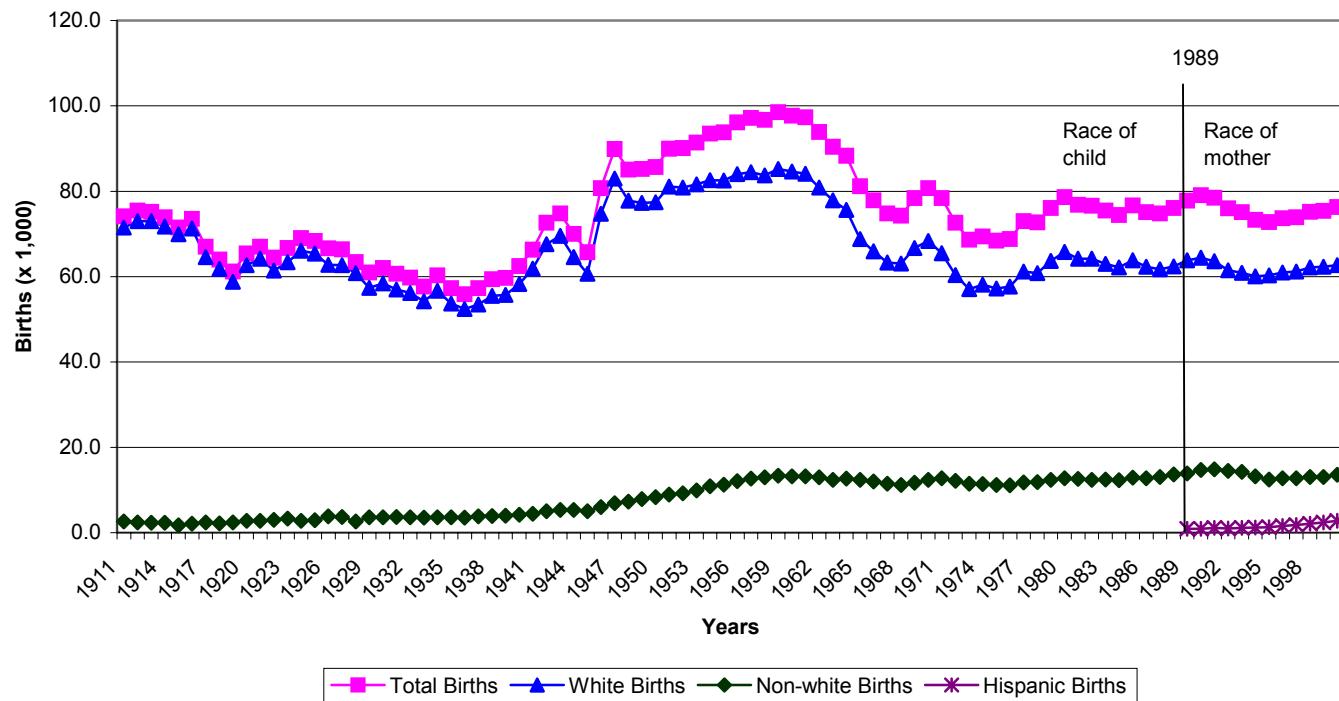
in fertility through the 1960s and early 1970s reflects in part the introduction of the contraceptive pill for women and the legalization of abortions in the early 1970s.⁴ Since 1980 the total fertility rate in Missouri has been relatively flat, but still decreasing. It fell to 63.3 in 2000. The rates in the late 1990s were the lowest of the century.

Chart 1 also shows that there has been very little difference between the fertility rate for white women and the total fertility rate over most of the century. This is expected, as 80 to 85 percent of the population in Missouri is white. On the other hand, the fertility rate for non-white women has been very different from the white rate over the same period. The non-white fertility rate was much lower than the white rate in the early decades of the century. However, after 1930 it began increasing. By the early 1940s the non-white fertility rate surpassed the white rate and has remained higher ever since. Like the white rate, the non-white rate reached its zenith in 1960, but the rate was almost 164 per 1,000 compared to the white rate of 113 per 1,000. Since 1960, the fertility rates for both race

groups have been decreasing; however the rate for the non-whites remained about 30 points higher than for whites through 1989. Because the method of recording births by race changed in 1989, it is not appropriate to compare rates by race before 1989 with rates after 1989. The distinction in the trend line before and after 1989 is indicated in Chart 1. It can be noted, however, that the white fertility rate in 1990 was 63.0 and the non-white rate was 102.2. In 2000, the non-white fertility rate fell to 73.8 per 1,000 women of childbearing age. The drop in the non-white fertility rate in 2000 was the result of the non-white population increasing and fewer non-white births.

Total births registered in Missouri declined in an uneven pattern from 75,452 in 1912 to 55,916 in 1936. Home births were much more common in the early part of the century and part of the fluctuations may have been due to inconsistencies in recording home births. Chart 2 shows a temporary decline in the number of births to 61,193 in 1919 partially due to the influenza epidemic of 1918. The number of births then increased in an

Chart 2: Missouri Trends in Live Births (x 1,000) by Race: 1911-2000



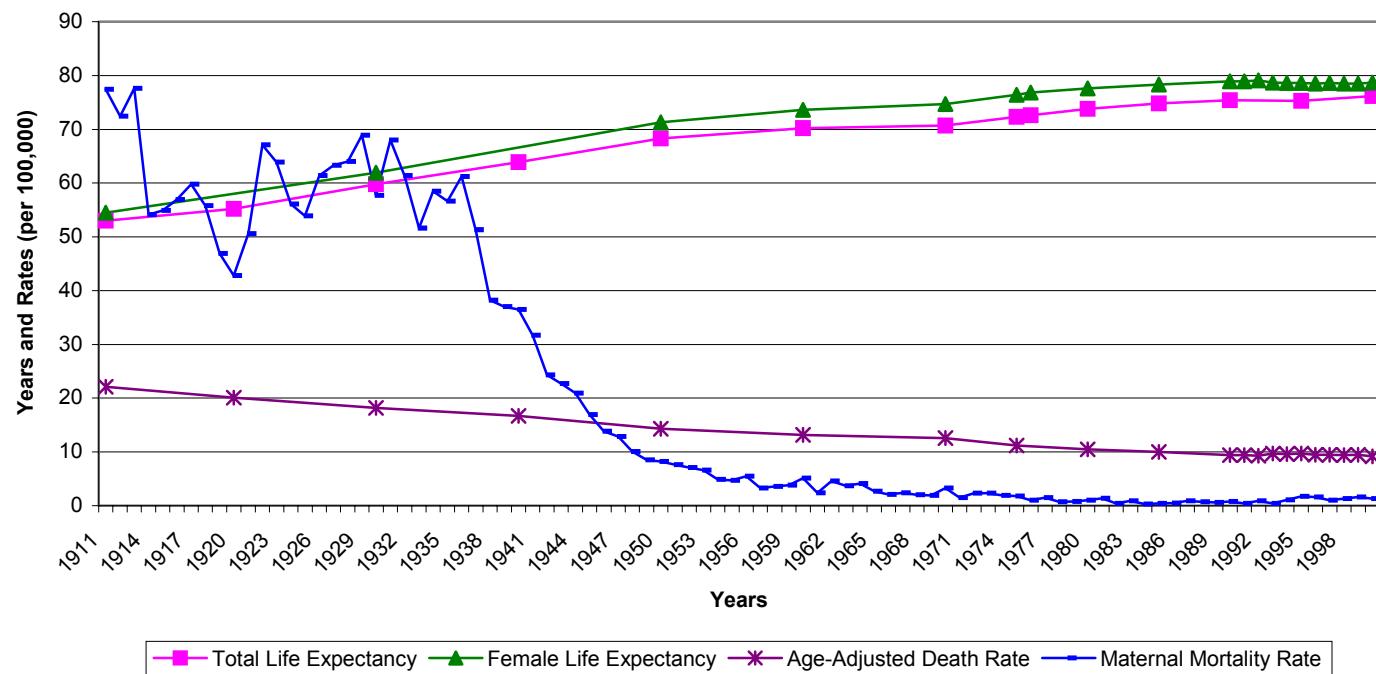
uneven pattern over the next five years to 68,961 in 1924 before resuming a gradual decline that bottomed out at 55,916 in 1936 during the Great Depression. As the state and nation pulled out of the Depression, so did the number of births. The total reached 74,820 in 1943 before falling over the next two years to 66,691 in 1945. The post-war boom began in 1946 with total births jumping to 80,698 - the highest official number up to that time. Over the next five years, 1947-1951, the yearly total was between 85,096 and 89,977. For the seven years from 1951 to 1957, the total for each year was a new record. After a slight drop in 1958, the century-high of 98,537 was reached in 1959. From 1911 through 2000, the three years with the most births were 1959, 1960 and 1961. For twelve years in a row, 1952-1963, there were over 90,000 births per year. For 20 years in a row, 1946-1965, there were over 80,000 births per year. Outside of that period, there was only one other year, 1970, in which there were over 80,000 births. Since 1965 the number of births has stayed between 80,707 (1970) and 68,442 (1975) as the baby boomers themselves went through their childbearing years. To put it another way, for the 90 years from 1911

to 2000, over 27 percent of all resident births occurred in just 20 years (22 percent of the years), 1946 to 1965.

Chart 2 also shows the relationship between white and non-white births over the century. Even though the method of determining race changed in 1989, one can see that the proportion of white births in relation to other races in Missouri has slowly declined over the years. For the first half of the century (until 1952), white births were over 90 percent of all births. White births have made up less than 90 percent of all births since 1952 and less than 85 percent since 1970. The low was 81 percent for 1991, 1992 and 1993. The percent of births that are classified as black has increased from the low of 2.3 in 1915 to the high of 17.4 in 1991 and 1992.

Statistics on births to women of Hispanic origin have been reported since 1989. Although they make up just 3.6 percent of all births in Missouri as of 2000, they have tripled in number and percent in 12 years.

Chart 3A: Missouri Trends in Total and Female Life Expectancy, Age-Adjusted Death Rates (per 100,000 Population) and Maternal Mortality Rates (per 100,000 Live Births): 1911-2000



Maternal Mortality and Female Life Expectancy

The overall improvement in the health of Missouri women of childbearing age (15-44) during the 20th century is exemplified by two dramatic trends: (1) the maternal mortality rate (MMR) declined by about 98 percent, from 770 per 100,000 live births in 1911 to 10 per 100,000 live births in 2000; (2) female life expectancy increased by more than 24 years (44 percent), from 54.5 years in 1911 to 78.7 years in 2000.

Maternal mortality was a major indicator of the availability of maternity care and the quality of that care in the early 20th century.⁵ In the early decades, the rate of maternal deaths was reported in terms of 10,000 live births. By the end of the century, maternal deaths had become so infrequent that the rate was reported per 100,000 live births. The dramatic changes in the MMR from 1911 through 2000 can be seen in Chart 3A. The fluctuations from one year to the next are due mostly to chance and inadequate reporting, even in the early decades when the frequencies were greater. This illustrates the instability of a rate based on relatively small

numbers. Changes over time are more apparent in Chart 3B, which shows the MMR overlaid by a 5-year moving average trend line.

A more useful representation of the changes in the MMR over time is presented in Chart 3C. This chart shows the MMR on a logarithmic scale with a 5-year moving average MMR trend line. Visual inspection of the trend line suggests at least four distinct periods for the MMR: 1911-1935, 1936-1958, 1959-1986, and 1987-2000. Using the weighted least squares technique described by Kleinman,⁶ the slope for each period was calculated and compared to the preceding period to determine whether there was a significant change. In addition, the percent annual change was calculated within each period. From 1911 through 1935, the percent annual change in MMR is only -0.5%. This is the flattest of the four periods. For 1936 through 1958, the percent annual MMR change was greatest, at -12.4%. The slope was significantly different from 1911-1935. For 1959 through 1986, the percent annual change was -6.9, but the difference in slope from 1936 through 1958 was not significant. The percent change from 1987

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Chart 3B: Missouri Trends in Maternal Mortality Rate (per 100,000 Live Births) with a 5-Year Moving Average Trend Line: 1911-2000

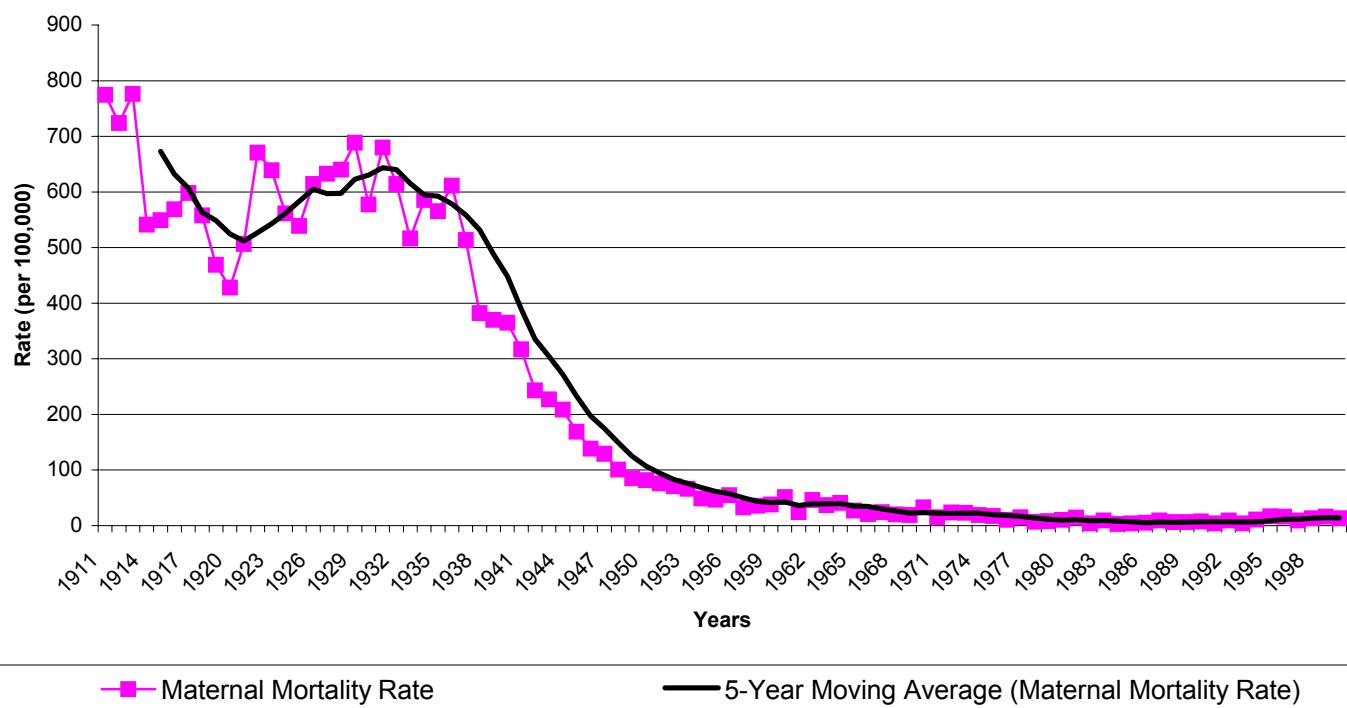
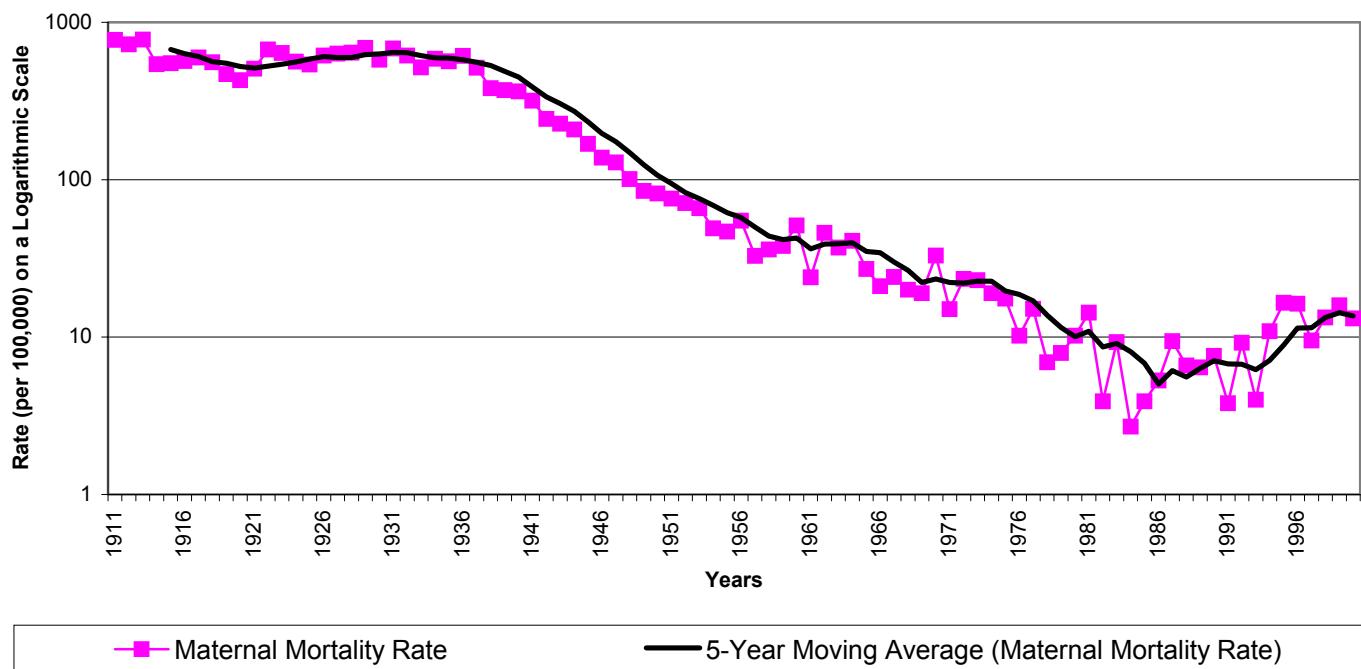


Chart 3C: Missouri Trends in Maternal Mortality Rates (per 100,000 Live Births) on a Logarithmic Scale with a 5-Year Moving Average Trendline: 1911-2000



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through 2000 was 6.8%, indicating that the MMR increased rather than decreased. However, the increase was not significant in comparison to the previous period.

Missouri's MMR was at its highest between 1911 and 1935. Charts 3A and 3B show dramatic yearly ups and downs during these years, but they are probably due to the variability of small numbers and poor reporting more than anything else. This was a time when hospital deliveries and use of aseptic procedures during labor and delivery were increasing. Prenatal care was being introduced and national policies meant to benefit the health status of poor women were being enacted. These developments did not result in a quick reduction of the MMR, most likely because: (1) in the 1920s and early 1930s most women still did not receive prenatal care; (2) the care they received, prenatal or during delivery, was not adequate to recognize and address the severity of complications; (3) the medical interventions received were improperly performed.⁷ Doctors were slow to recognize that many of the dangers of childbirth originated in the hospital environment or in the medical treatment itself.⁸ Puerperal fever, a leading cause of maternal deaths during this period, was a classic example. General practitioners commonly followed ineffective sanitary procedures, running a needle or probe through a bar of soap to sterilize it and cleaning their hands by wiping them on a towel. Hospitals overlooked that women who had operative interventions were more susceptible to infection. Bacteria were easily carried from one infected woman to others in a hospital and could be transmitted by a doctor or nurse from one house to another. Midwives were less likely to carry bacteria and to intervene operatively than doctors.⁹ Studies in the 1930s reported that uneducated immigrant midwives in New York had septicemia rates no worse than those of doctors.¹⁰ A study comparing the practices of female and male doctors in Boston hospitals found that female doctors lost fewer patients to puerperal fever than male doctors because they exercised more professional discipline, more regularly scrubbing themselves, and used instruments to hasten deliveries less frequently than male doctors.¹¹

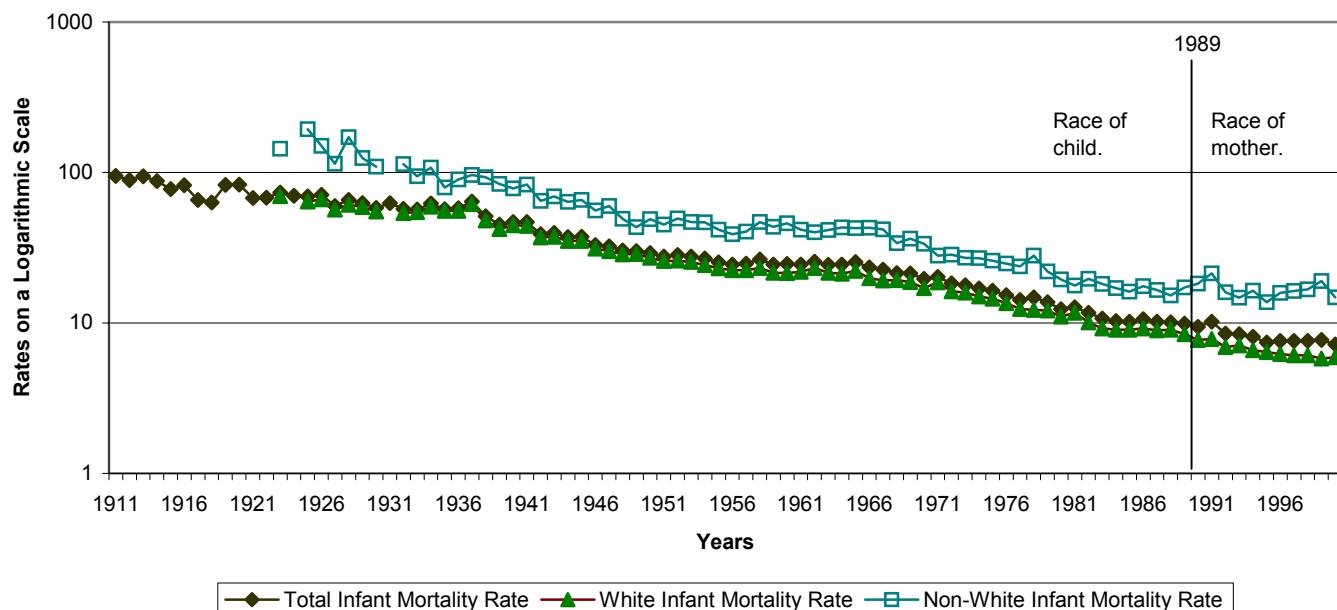
The remarkable drop in the MMR after 1935 has been attributed to a shift in maternity care to obstetricians (nationally, births in hospitals increased from 36.9 percent in 1936 to 94.4 percent in 1955), new antibiotics, hospital blood banks, blood typing and better transfusion procedures, safer forms of anesthesia, and elimination of mid- and high forceps to remove an impacted fetus. Other indirect influences such as a rising standard of living, higher educational levels among women, and environmental interventions could also have contributed to the drop. The further decline in maternal mortality after 1970 may be due in part to reductions in infections related to septic abortions. Nationally, women were able to receive safer abortions following the Supreme Court decision legalizing abortions in *Roe vs. Wade* in 1973.¹²

Life expectancy for women increased more than 24 years during the century. Beginning in 1911 at 54.4 years, female life expectancy (FLE) reached a high of 79.1 in 1992. Chart 3A shows that FLE increased over most of the century, with most of the increase occurring before 1950. From 1911 to 1950, FLE increased a total of 16.8 years. Over the next 50 years, the increase was 7.4 years. In other words, 69.4 percent of the total increase from 1911 to 2000 occurred by 1950, a period that included the deadliest epidemic and worst economic conditions of the century. A significant part of the increase is probably due to reductions in infant, child and maternal mortality that occurred prior to 1950. The timing of these developments helped to set the stage for the "baby boom" that followed in the 1950s and 1960s.

Infant Mortality and Low Birth Weight Births

Infant mortality has historically been considered an indicator of the general well being of infants and children. For this report, the infant mortality rate (IMR) is the number of infants in a given year that died before their first birthday per 1,000 live births in the same year. Infant death rates are available for every year from 1911 to 2000. Chart 4A shows that the total IMR decreased from 95.1 in 1911 to 7.2 in 2000, a drop of 92.4 percent. Half of the decrease occurred from 1911 to 1938. Almost another quarter, 24 percent, occurred from 1938 to

Chart 4A: Missouri Infant Mortality Rates (per 1,000 Live Births) by Race, on a Logarithmic Scale: 1911-2000



1949. Early in the century, efforts to improve environmental and living conditions in urban areas were probably most instrumental in improving the IMR. Social welfare efforts were directed toward safe milk supplies, parenting education, and improved housing and sanitation. Comprehensive maternal and infant care included prenatal and intrapartum care, and postpartum home visits by a health care worker. Medical advances in the 1930s and 1940s included the introduction of antibiotics, blood banking, safe blood transfusions, and the development of fluid and electrolyte replacement therapy. Only about 25 percent of the decrease in IMR during the 20th century has occurred since 1950. Yet in the 1950s, prenatal care became more widely available, there were important medical advances, and a greater percentage of births were taking place in hospitals. In the 1960s and 1970s, the following factors played a role in reducing infant mortality: Medicaid and other federal programs, increased use of family planning services, changes in abortion laws, further improvements in living standards, increased educational attainment among women, advances in neonatal medicine and regionalization of tertiary care hospitals. Between 1989 and 1990 surfactant

began to be used to prevent or reduce the severity of Respiratory Distress Syndrome in very low birth weight infants. This has been effective in reducing the number of infant deaths. The number of sudden infant death syndrome (SIDS) deaths has decreased among post neonatal infants of normal birth weight in the 1990s. This is mostly due to a change in parenting behavior, in which infants are put down on their back or side to sleep.¹³

Chart 4A also shows the IMR for whites and non-whites for 1923 through 2000. There is a break in the trend line for each race between 1988 and 1989 because of the change in the way race was determined. The non-white rate experienced wider fluctuations than the white rate but that was most likely because of smaller numbers. For the years 1923 through 1988, both rates decreased by almost the same percentage, the white rate 87.1 percent and the non-white rate 89.4 percent. Throughout most of the century however, the relationship of the non-white IMR to the white IMR has remained nearly the same. Aside from a few anomalous years, the ratio of the non-white IMR to the white IMR has ranged between 1.51 and 2.27. The 1989 change in determining race

described earlier resulted in small decreases in the white IMR and small increases in the non-white IMR. The ratios for 1989 through 2000 are therefore higher than any other period and cannot be appropriately compared to the ratios for previous years. It can be seen, however, that the infant death rates for whites and non-whites have been stable since 1989.

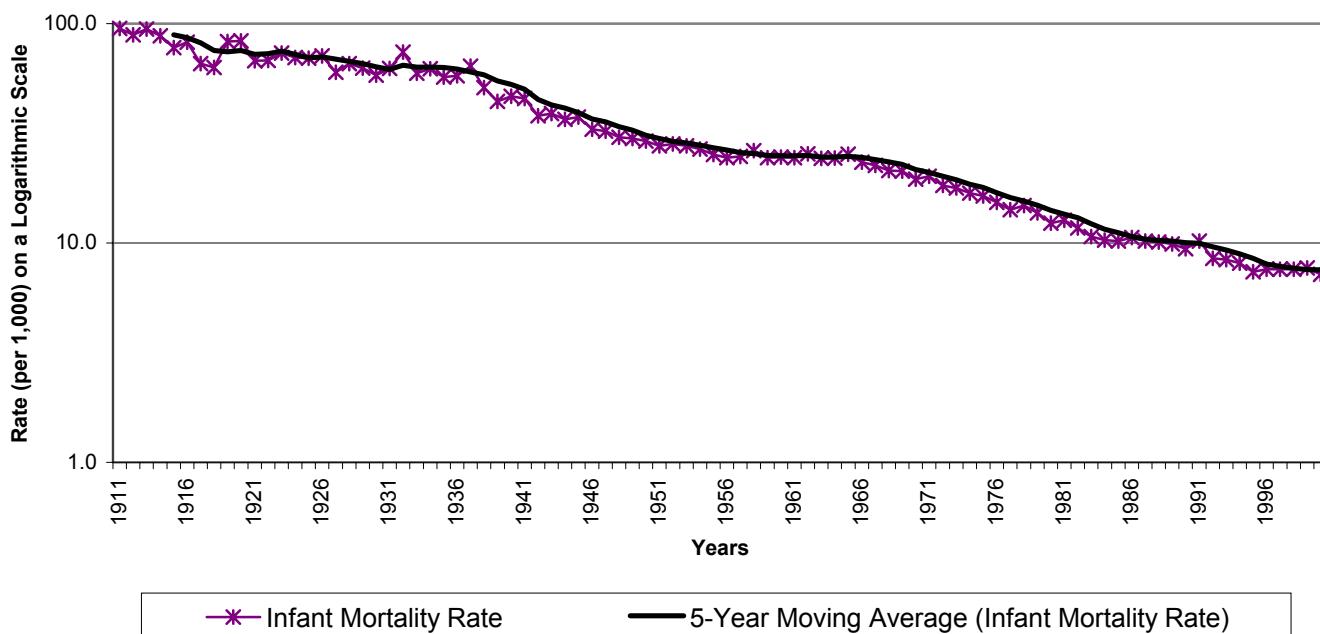
As with maternal deaths, infant deaths are rare events that regress to the Poisson distribution more than to a linear model. A more useful depiction of the changes in the IMR over time is presented in Chart 4B. This chart shows the IMR on a logarithmic scale with a 5-year moving average IMR trend line. Visual inspection of the trend line suggests at least five distinct periods for the IMR: 1911-1935, 1936-1958, 1959-1966, 1967-1986, and 1987-2000. Using the same weighted least squares technique as used for maternal deaths, the slope for each period was calculated and compared to the preceding period to determine whether there was a significant change. In addition, the percent annual change was calculated within each period.

For 1911 through 1935, the change in the IMR was -1.8% annually. For 1936 through 1958, the

percent annual change was -4.0 , with a significant decrease in the slope between 1911-1935 and 1936-1958. The percent annual change for 1959 through 1966 was -0.2 , and the change in slope from 1936-1958 to 1959-1966 was not significant. For 1967 through 1986, the percent annual change was -4.3 , and there was a significant change in the slope between 1959-1966 and 1967-1986. Finally, for 1987 through 2000, the percent annual change was -2.9 , and the difference in slope from 1967-1986 was not significant.

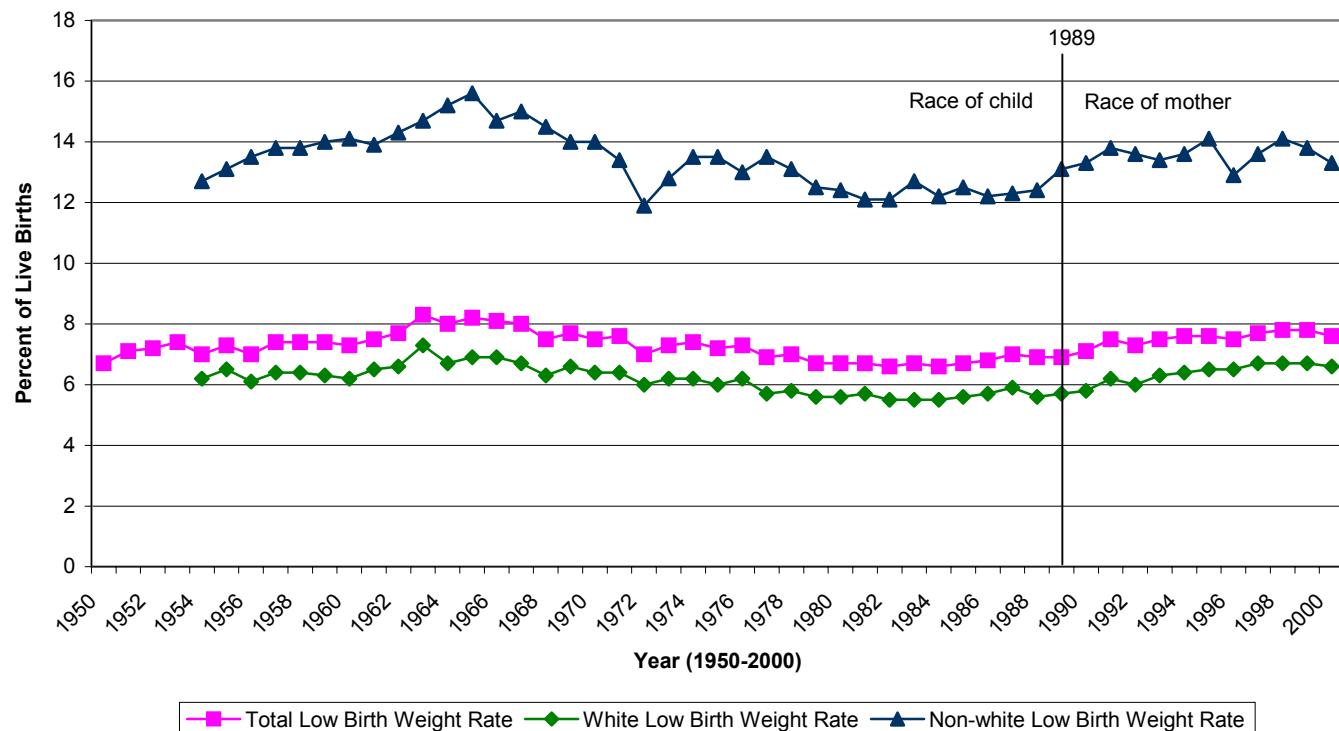
Infants born weighing less than 2500 grams have a greater risk of death before their first birthday than other infants. Low birth weight data for all live births has only been available since 1950. Birth weight by race has only been available since 1954. Although low birth weight rates (LBWR) have remained relatively flat, Chart 4C illustrates that, as with IMR, there has been a uniform difference between the non-white LBWR and the white LBWR. The ratio of non-white to white LBWR has remained between 2.0 and 2.4. Changes in the way births were recorded by race in 1989 make comparison of rates by race before 1989 with rates after 1989 inappropriate.

Chart 4B: Missouri Trends in Infant Mortality Rates (per 1,000 Live Births) on a Logarithmic Scale with a 5-Year Moving Average Trendline: 1911-2000



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Chart 4C: Missouri Low Birth Weight Rates (Percent of Live Births), by Race: 1950-2000



An observable increase in the white LBWR occurred in the 1990s. This has been partially attributed to an increase in multiple births. The increase in multiple births has been associated with increased use of ovulation-inducing drugs and assisted reproduction technologies among white women, and to a lesser extent to a rising age of childbearing.¹⁴

Out-of-Wedlock Births

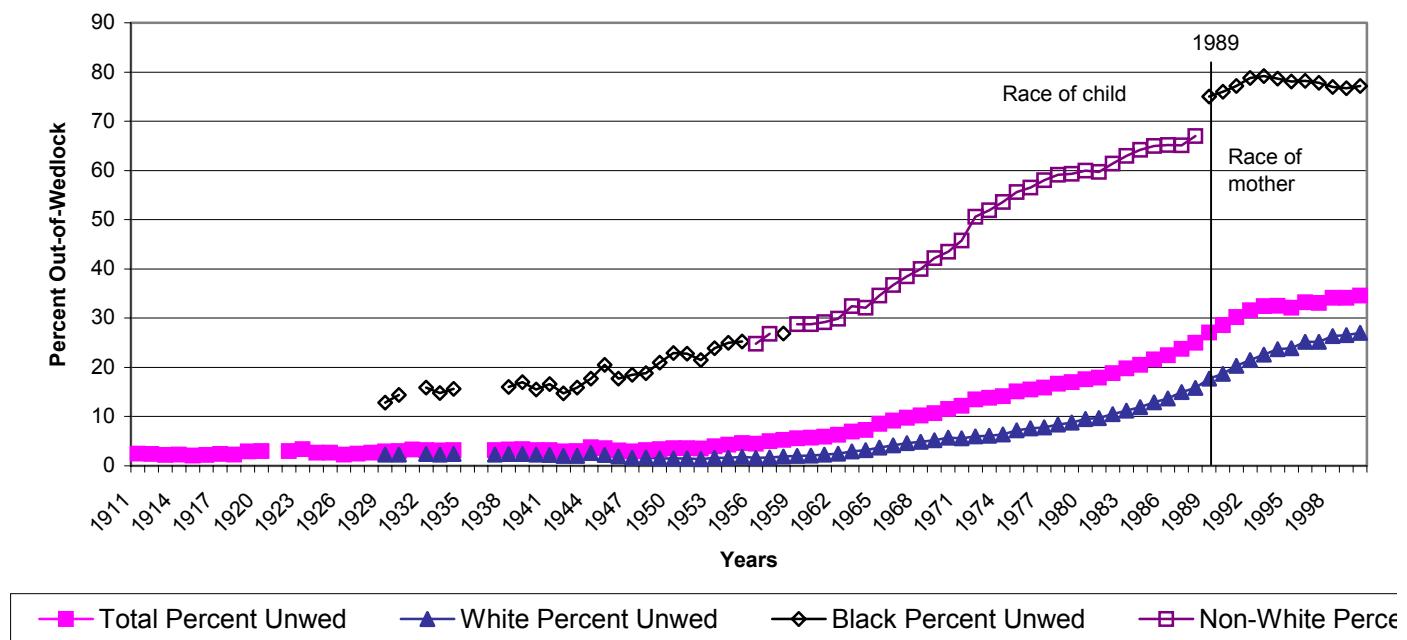
Marital status of the mother is based on self-reporting at the time of delivery. Marital status is of interest to public health as a socio-economic factor related to material and social resources that may be available for the benefit of the mother and infant.

Chart 5 shows out-of-wedlock births as the percent of live births for 1911-2000, and by race for 1929 through 2000. Due to changes in recording and reporting race information, "non-white" births are presented instead of "black" births for 1956, 1957, and 1959 through 1988. For

whites, the percent of out-of-wedlock births in 1929 was 2.3. It stayed very low for several years, reaching 2.6 in 1944 and falling to 1.4 in 1952. Since 1952 there have only been three years when the percent of white out-of-wedlock births did not increase. From the low in 1952, the percent more than doubled to 2.9 in 1963, more than doubled again to 6.0 in 1972, and again to 12.9 in 1985. As noted earlier, there were changes in 1989 in the way race is recorded which make it inappropriate to make comparisons by race between pre- and post-1989 rates. In year 2000 twenty-seven percent of all white births were out-of-wedlock.

For blacks/non-whites, the out-of-wedlock pattern is different and the percentages are higher. There is more variability in the percentages from year to year, due to the smaller number of total black/non-white births. The lowest percent for the century was the first year reported, 12.8 in 1929. There was a short period of stable percentages from 1932 to 1942, as percentages fluctuated between 14.7 and 17.0. After dipping to 14.7 in 1942, the overall trend began a long ascent. The percentage

Chart 5: Missouri Trends in Percent Out-of-Wedlock Births by Race: 1911-2000



reached 20.5 in 1945 and 32.4 in 1963. It accelerated to 40.0 by 1968, to 50.6 by 1972, and to 60.0 percent by 1980. In 1989 the black out-of-wedlock rate was 75.0 percent. It reached the high of 79.2 percent by 1993. After 1993, the percentage gradually dropped to 76.7 by 1999 before increasing to 77.2 in 2000.

For all races, out-of-wedlock births as a percent of live births started out at 2.5 percent in 1911 and increased only to 3.6 percent by 1950. It then had two remarkable periods of increase: up to 18.1 percent by 1975 and from 17.6 percent in 1980 to 34.6 percent in 2000. The percent of live births that are born out-of-wedlock increased by a factor of 13.8 from 1911 to 2000. Although not shown on Chart 5, the total out-of-wedlock fertility rate per 1,000 unmarried females ages 15-44 has a pattern similar to the total percent out-of-wedlock. The total fertility rate stays low and flat from 1911 through 1949, between 5.7 and 6.3. It then increases four fold from 6.0 per 1,000 to 24.1 per 1,000 in just 20 years (1940-1960), increases slowly to 29.9 per 1,000 over the next 20 years (1960-1980), and shoots up again to 45.1 per 1,000 over the last 20 years (1980-2000). Overall, the

out-of-wedlock fertility rate per 1,000 unmarried females aged 15-44 has increased by a factor of 7.5 since 1940.

Summary

The health of Missouri women of childbearing age and their infants improved dramatically in the 20th century. Mothers and infants are much more likely to survive delivery now than they were 100 years ago, and they will most likely live a longer life. The greatest reductions in maternal and infant deaths occurred during the 1930s, 40s and 50s and have been attributed to more effective ways of preventing and treating infections; increased numbers of deliveries occurring in hospitals; advances in technologies of blood banking, blood typing and blood transfusions; and management of prenatal care and deliveries by obstetricians and gynecologists. For infant deaths in particular, reductions in the 1930s and 40s have also been attributed to safer milk supplies, improved housing conditions and sanitation, and parenting education. Reduced infant deaths were a significant factor in the increase in life expectancy for both genders, and female life expectancy was further increased by

the reduction in maternal deaths. These developments, combined with the return of thousands of young men to civilian life after World War II, set the stage for the remarkable surge in fertility rates and births from about 1945 to about 1965 and impacted characteristics of the total population for the remainder of the century. Even though the fertility rate subsequently fell lower than it had been for most of the century, there were so many more females in the population after the “boom” years that the total number of live births stayed high as these women progressed through their childbearing years.

At the close of the century, there were both old and new challenges regarding maternal and infant health. Racial disparities that existed at the beginning and middle of the century in low birth weight births and infant and maternal deaths were still present. A new challenge is the gradual increase in the percent of low birth weight births among white infants since the late 1980s, partially attributed to multiple births associated with the use of ovulation-inducing drugs and assisted reproduction technologies. The population mix in Missouri is changing. Over the last 50 years, non-white fertility has been higher than white fertility and the percent of non-white births has gradually increased. In the last half of the century there was also a remarkable increase in infants born out-of-wedlock, reaching over one-third of all live births by the year 2000. The mothers of these infants tended to be younger, poorer and less educated than other mothers.

It is hard to imagine improvements in any maternal and infant health indicators in the 21st century as dramatic as what occurred in the 1930s, 40s, and 50s. Measures of maternal and infant health may remain static or deteriorate for the near future. Future improvements will be harder to achieve, coming in smaller increments over longer periods of time.

References:

1. Annual Report of the Missouri Board of Health, 1909.
2. Missouri Vital Statistics Annual Report, 1989. This is in conflict with Bernard Guyer, Mary Anne Freedman, Donna M. Strobino, and Edward J. Sondik, “Annual Summary of Vital Statistics: Trends in the Health of Americans During the 20th Century”, *Pediatrics*, Vol. 106, No. 6, pp. 1307-1317, which reports that NCHS made its change in 1980.
3. Joel C. Kleinman, “State Trends in Infant Mortality”, National Center for Health Statistics, 1984.
4. Bernard Guyer, Mary Anne Freedman, Donna M. Strobino, and Edward J. Sondik, “Annual Summary of Vital Statistics: Trends in the Health of Americans During the 20th Century”, *Pediatrics*, Vol. 106, No. 6, pp. 1307-1317.
5. Ibid
6. Kleinman, “State Trends in Infant Mortality”.
7. Guyer, Freedman, Strobino, and Sondik, “Annual Summary of Vital Statistics: Trends in the Health of Americans During the 20th Century”.
8. Richard W. Wertz and Dorothy C. Wertz, Lying-In: A History of Childbirth in America (New York: The Free Press; 1977), p. 136.
9. Ibid., pp. 120-128.
10. Ibid., p. 127 references D.W. Cattell and W.T. Cattell, Book on the Physician Himself (Philadelphia, 1902), p. 27; New York Academy of Medicine, Maternal Mortality in New York City: A Study of Puerperal Deaths, 1930-1932, (New York, 1933), pp. 191, 211.
11. Ibid., p. 127 references Alice B. Crosby, The Story of the New England Hospital, 1862-1937, (Boston, 1937); Laurie Crumpacker, “Female Patients in Four Boston Hospitals: Sex, Class and Science in Late Nineteenth-Century Medicine,” unpublished paper in Schlesinger Library, Radcliffe College.
12. Guyer, Freedman, Strobino, and Sondik, “Annual Summary of Vital Statistics: Trends in the Health of Americans During the 20th Century”.
13. Ibid.
14. Ibid.

Provisional Vital Statistics for September 2002

Live births decreased in September as 5,039 Missouri babies were born compared with 6,137 in September 2001. For the cumulative 9-month period ending with September, births increased very slightly but the birth rate decreased slightly.

Deaths decreased in September as 2,905 Missourians died compared with 3,948 one year earlier. However, cumulative deaths for the 9- and 12- month periods ending with September both show increases.

The **Natural increase** in September was 2,134 (5,039 births minus 2,905 deaths). For the cumulative 9—and 12— month periods ending with September, the natural increase declined.

Marriages decreased slightly in September and January—September, but increased slightly for the 12-months ending with September.

Dissolutions of marriage increased in September, but decreased for the cumulative 9— and 12— month periods ending with September.

Infant deaths decreased slightly in September as 35 Missouri infants died compared with 47 one year earlier. However, cumulative infant deaths have increased, as the infant death rate for the 12 months ending with September increased from 7.7 to 8.3 per 1,000 live births.

PROVISIONAL VITAL STATISTICS FOR SEPTEMBER 2003

Item	September				Jan.-Sept. cumulative				12 months ending with September					
	Number		Rate*		Number		Rate*		Number		Rate*			
	2001	2002	2001	2002	2001	2002	2001	2002	2001	2002	2000	2001	2002	
Live Births	6,137	5,039	12.8	10.1	56,852	57,046	13.5	13.4	75,727	75,723	13.8	13.5	13.4	
Deaths	3,948	2,905	8.2	5.8	41,282	43,051	9.8	10.1	54,362	56,096	9.8	9.7	9.9	
Natural increase	2,189	2,134	4.6	4.3	15,570	13,995	3.7	3.3	21,365	19,627	4.0	3.8	3.5	
Marriages	4,636	4,621	9.7	9.3	32,780	32,739	7.8	7.7	41,960	42,045	8.0	7.5	7.4	
Dissolutions	1,702	2,181	3.6	4.4	17,608	17,419	4.2	4.1	23,802	23,369	4.5	4.2	4.1	
Infant deaths	47	35	7.7	6.9	467	491	8.2	8.6	581	628	7.6	7.7	8.3	
Population base..... (in thousands)	...	...	5,637	5,673	...	...	5,637	5,673	...	...	5,583	5,626	5,664	

* Rates for live births, deaths, natural increase, marriages and dissolutions are computed on the number per 1000 estimated population. The infant death rate is based on the number of infant deaths per 1000 live births. Rates are adjusted to account for varying lengths of monthly reporting periods.

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